



ATSDR
AGENCY FOR TOXIC SUBSTANCES
AND DISEASE REGISTRY

Public Health Assessment for

SDMS Document



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OLD ROOSEVELT FIELD CONTAMINATED GROUNDWATER AREA
GARDEN CITY, NASSAU COUNTY, NEW YORK
EPA FACILITY ID: NYSFN0204234
JULY 13, 2004

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

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THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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PUBLIC HEALTH ASSESSMENT

OLD ROOSEVELT FIELD CONTAMINATED GROUNDWATER AREA

GARDEN CITY, NASSAU COUNTY, NEW YORK

EPA FACILITY ID: NYSFN0204234

Prepared by:

New York State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations; the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When informed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E60), Atlanta, GA 30333.

TABLE OF CONTENTS

SUMMARY	1
PURPOSE AND HEALTH ISSUES	3
BACKGROUND	3
A. Site Description and History	3
B. Site Visit	4
C. Demographics	5
DISCUSSION	6
A. Environmental Contamination	6
B. Pathways Analysis	8
C. Public Health Implications	9
D. Health Outcome Data	11
E. ATSDR Child Health Considerations	12
COMMUNITY HEALTH CONCERNS	13
CONCLUSIONS	14
RECOMMENDATIONS	15
PUBLIC HEALTH ACTION PLAN	15
REFERENCES	17
PREPARERS OF REPORT	19
CERTIFICATION	20
APPENDIX A	
Figures	21
APPENDIX B	
Tables	25
APPENDIX C	
New York State Department of Health Procedures for Evaluating Potential Health Risks for Contaminants of Concern	28
APPENDIX D	
Public Health Hazard Categories	31
APPENDIX E	
Glossary	34

SUMMARY

The former Roosevelt Air Field Hanger site, now occupied by a shopping mall and office buildings, is at the intersection of Old Country Road and Clinton Road in Garden City, Nassau County, New York (Appendix A, Figure 1). The Old Roosevelt Field Contaminated Groundwater Area (ORCA) is primarily on the eastern side of Clinton Road, 0.6 miles south of Old Country Road (Appendix A, Figures 2 and 3). The ORCA has affected both the Roosevelt Field and the Clinton Road public water supply well fields. The ORCA contains volatile organic compounds (VOCs) at concentrations above drinking water standards. The United States Environmental Protection Agency (US EPA) proposed the ORCA site for the National Priorities List (NPL) in February, 2000 and listed the site in May, 2000. This public health assessment (PHA) fulfills the congressional mandate that requires a PHA for each site proposed for the NPL.

The Town of Hempstead public water supply well field at Roosevelt Field consisted of three wells that were all closed, one in 1980 and two in 1991. Before the Town closed the well field in 1991, some residents of the Town of Hempstead Roosevelt Field Water District were exposed to VOCs in their drinking water. All three wells remain closed.

The Village of Garden City closed two contaminated public water supply wells in the Clinton Road well field, one in 1987 and one in 1989. Some residents living in the Village of Garden City Water District were exposed to VOCs in their drinking water before these wells were closed. The Village installed an air stripper treatment system on the wells and started using them again in September 1989. Some residents of the water district may have been exposed to VOCs when the treatment system failed in 1993 and 1995. The Village temporarily took the wells off-line, upgraded the treatment system, and put the wells back into service after sampling and analyses confirmed the water met New York State Department of Health (NYS DOH) drinking water standards.

Although samples from the Roosevelt Field and Clinton Road public water supply wells contained VOCs at levels above the current NYS DOH drinking water standards, actual concentrations in residential tap water were probably less. In most public water supply distribution systems, water from many supply wells is mixed. This mixing dilutes the water from contaminated wells with water from clean wells. Therefore, the concentrations of contaminants throughout the Town of Hempstead and Village of Garden City drinking water distribution systems, including the residential taps, were probably lower than in the contaminated wells. However, without historic data showing the extent of the dilution, NYS DOH assumed a "worst case" scenario (i.e., NYS DOH assumed that some individuals received water at the maximum contaminant concentration detected. This means that the NYS DOH used the maximum contaminant concentration detected to determine health risks associated with this site.

Because people were exposed to VOCs in the public drinking water supplies at levels above the Federal and State drinking water standards, public health actions were required to reduce the exposures, such as treating the water or closing some wells. People were exposed to VOCs in drinking water via ingestion, inhalation and dermal contact. The exposures could have occurred for an unknown amount of time prior to 1976 until 1980, or for some people, up to 1989. The NYS DOH estimates that the chance that someone would actually get cancer from their past exposures is low. The chance that someone would get a non-cancer adverse health effect is estimated to be minimal or low, depending on the chemical and the concentration of the exposure. See the Public Health Implications section of this document for the risk associated with the individual chemicals found in the ORCA. Based on the public health hazard category classification used by the Agency for Toxic Substances and Disease Registry (ATSDR) (Appendix D), the ORCA site poses no apparent public health hazard because water suppliers installed treatment systems on the contaminated public water supplies to remove VOCs. However, the suppliers must continue to monitor the wells to confirm that the water meets drinking water standards.

The NYS DOH held a public comment period from March 18 to June 16, 2002 after the public release of this PHA. The NYS DOH asked area residents to review the document and send in any questions or additional information so that it could be considered as the document is finalized. The NYS DOH received three comment forms. One had no comments, the second thanked us for soliciting opinions, and the third discussed confidential personal health issues. No changes in the PHA were made based on the public review of the document. However, the PHA has been updated and some editorial changes were made for clarification. No public meetings have been held for the ORCA site. However, representatives of environmental groups expressed concerns about groundwater contamination from ORCA at public meetings for two nearby sites, Pasley Solvents and the Garden City Park Industrial Area. The NYS DOH and ATSDR will solicit community concerns at future public meetings about the ORCA site.

The NYS DOH has not evaluated health outcome data specifically for this site. The NYS DOH is developing a registry of individuals in New York State who have been exposed to VOCs in drinking water. The VOC Exposure Registry may help contribute to knowledge about whether specific health outcomes may be related to exposures to the specific chemicals, particularly trichloroethene and tetrachloroethene, that are associated with the ORCA site.

The US EPA began a remedial investigation (RI) of the ORCA in early 2003 to further characterize the extent and nature of the contamination and to further assess potential exposure routes. The NYS DOH reviewed the RI work plans to ensure adequate environmental samples are collected to assess potential exposure pathways. The NYS DOH will also review the results of the RI and make appropriate recommendations to protect human health. The affected, and potentially affected, public water supply wells will continue to be monitored by the water supplier, and the Nassau County Department of Health (NCDH) will continue to review the data.

PURPOSE AND HEALTH ISSUES

A plume of contaminated groundwater affected some Village of Garden City and Town of Hempstead public water supply wells on and downgradient of Roosevelt Field. This public health assessment (PHA) summarizes environmental data, evaluates the public health implications, answers community questions about possible exposures and makes recommendations for site-specific health activities, where appropriate.

BACKGROUND

A. Site Description and History

The Old Roosevelt Field Contaminated Groundwater Area (ORCA) is the contaminated groundwater plume downgradient of the former Roosevelt Air Field Hanger site. The ORCA contains volatile organic compounds (VOCs) at concentrations above drinking water standards, primarily carbon tetrachloride, 1,1-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, and trichloroethene (United States Environmental Protection Agency (US EPA), 2000). Most of ORCA is east of Clinton Road, 0.6 mile south of the intersection with Old Country Road in Garden City, Nassau County, New York. The plume affects both the Upper Glacial and the Magothy aquifers as shown in Figures 2 and 3 of Appendix A [United States Geological Survey (USGS), 1989]. Most public water supply wells draw from the Magothy aquifer. The Upper Glacial aquifer directly overlies the Magothy in this area of Long Island. The ORCA has affected two public water supply well fields: the Town of Hempstead well field at Old Country Road (wells N5484, N5485, N5486) and the Village of Garden City well field on Clinton Road (wells N3934 and N3935) (US EPA, 2000). In addition to carbon tetrachloride, 1,1-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, and trichloroethene, other VOCs, including benzene, hexachlorobutadiene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, toluene, trichlorofluoromethane were detected in the public water supply wells. Although the presence of these chemicals in the groundwater is not inconsistent with historic use of the site, we do not know if all of the VOC contamination of the public water supply wells is due to the Old Roosevelt Field site.)

Roosevelt Air Field was active from 1911 to 1951. The air field hanger site consisted of runways, aircraft maintenance hangers, and several other buildings (US EPA, 2000). These facilities were demolished in 1951 (US EPA, 2000) for the construction of a large shopping mall and office building complex that presently occupies the 200 acre site.

In 1975, the groundwater in two industrial supply wells in Nassau County contained chlorinated organic chemicals at levels higher than drinking water standards. In November 1976, the Nassau County Department of Health (NCDH) initiated a program to sample all public water supply wells in the County. One public water supply well and five wells used to supply air conditioning condensers in the northern part of the Town of Hempstead contained trichloroethene at levels

above the New York State Department of Health (NYS DOH) drinking water guideline in effect at that time for public water supplies (50 micrograms/liter). The NCDH did not identify any sources of contamination at that time [Agency for Toxic Substances and Disease Registry (ATSDR), 1998a].

In 1982, the Nassau County Department of Public Works, in cooperation with the United States Geological Survey (USGS), evaluated the levels and movement of VOCs near the Old Roosevelt Air Field Hanger site (USGS, 1989). The results of this investigation are summarized in the Environmental Contamination section of this PHA.

The Old Roosevelt Air Field Hanger site was placed on the New York State Registry of Inactive Hazardous Waste Sites in 1991 as a Class 2 site. Class 2 sites may pose a threat to the environment or public health; therefore, a remedial investigation (RI) is required to define and assess all potential exposure routes.

In 1998, the NYS DOH and ATSDR released the Old Roosevelt Air Field Hanger Site Health Consultation (ATSDR, 1998a). The agencies prepared the health consultation at the request of area residents and environmental groups. The agencies reviewed environmental data available at that time; evaluated the potential for human exposure to contamination through dermal contact, ingestion or inhalation; assessed community concerns and made recommendations to minimize exposures. For example, the 1998 health consultation recommends that the Village of Garden City and the Town of Hempstead continue to monitor wells affected by, or potentially affected by, the contaminant plume.

The US EPA proposed the ORCA for the National Priorities List (NPL) in February, 2000, and it listed the site in May, 2000. This PHA fulfills a congressional mandate that requires a PHA for each site proposed to the NPL.

B. Site Visit

Mr. Zwelonke I. Ushe of the NYS DOH visited the ORCA site on April 13th, 2003. A large shopping mall, parking lots, and several commercial office buildings occupy the former Roosevelt Air Field Hanger site. The area is mixed residential and commercial. The residences are primarily west and south of the former Roosevelt Air Field Hanger site. Mr. Ushe did not see any physical hazards at the site.

C. Demographics

The NYS DOH estimated from the 1990 Census (US Bureau of Census, 1991) that 21,706 people live in the area supplied with public water by the Village of Garden City and the Roosevelt Field Water District. The median household income data comes from US Bureau of the Census (1992). The following chart compares local demographics with statewide averages. There are nine schools and no nursing homes within the area.

	New York State	Roosevelt Field & Garden City Water Districts
<u>Age Distribution</u>		
<6	8.3%	5.6%
6-19	18.4%	19%
20-64	60.2%	58.8%
>64	13.1%	16.6%
<u>Race Distribution</u>		
White	74.4%	95.8%
Black	15.9%	1.2%
Native American	>1%	>1%
Asian	3.9%	2.8%
Other	5.5%	0.2%
<u>Ethnicity Distribution</u>		
Percent Hispanic	12.3%	2.4%
<u>Income</u>		
1989 Median Income	\$32,965	\$74,506
% Below Poverty Level	13.0%	1.8%

DISCUSSION

A. Environmental Contamination

Groundwater is contaminated with VOCs on the eastern side of Clinton Road, 0.6 miles south of Old Country Road, in Garden City, New York. This contaminated groundwater is on and downgradient of the Old Roosevelt Air Field Hanger site and was included in the study area of the USGS investigation previously mentioned in the Site Description and History Section. The study area was a 10 square mile area around Roosevelt Field that included 52 monitoring wells, 28 public water supply wells, and 25 cooling water wells (for a total of 105 wells). The USGS collected and analyzed several rounds of samples from these wells in the summer of 1983 and spring of 1984. Forty-four of the 105 wells sampled contained high levels of VOCs. Cooling water well samples contained levels of trichloroethene up to 38,000 micrograms per liter (mcg/L), cis-1,2-dichloroethene up to 2,800 mcg/L, and tetrachloroethene up to 350 mcg/L. The extent of VOC contamination detected in the Upper Glacial and Magothy aquifers in 1984 is shown on Figures 2 and 3 (Appendix A) (USGS, 1989).

All public water supply wells in the area near this site are routinely monitored for VOC contamination. In the 1970's and 1980's, the NYS DOH drinking water guideline for VOCs, including trichloroethene was 50 mcg/L. Whenever this guideline was exceeded in a public water supply well, the water supplier closed the affected well until the water was treated and NYS DOH drinking water guidelines were met. In 1989, the NYS DOH adopted a drinking water standard of 5 mcg/L for certain VOCs, including trichloroethene. Consequently, suppliers closed additional public water supply wells and installed treatment systems on others.

VOC contamination has affected five public drinking water supply wells in two well fields downgradient of the Old Roosevelt Air Field Hanger site (Table 1) (USEPA, 2000; USGS, 1989). The Town of Hempstead public drinking water supply well field at the Old Roosevelt Air Field Hanger site had three wells. Due to VOC contamination, the Town closed well #N5486 in 1980 and wells N5484 and N5485 in 1991. Samples from the Town of Hempstead Roosevelt Field Water District well field contained trichloroethene at the following maximum concentrations: between 1977 and 1988, well # N5484 contained up to 16 mcg/L; between 1977 and 1986, well # 5485 contained up to 100 mcg/L; and between 1977 and 1980, well # 5486 contained up to 170 mcg/L (USGS, 1989; NCDH, 2000). Between 1977 and 1980, samples from well # 5486 were analyzed four times for benzene and it was detected in one sample at 15 mcg/L (NCDH, 2000). In 1984, the two public water supply wells still on line at the Old Roosevelt Air Field Hanger site (N5484 and N5485) were sampled as part of the USGS study and contained 11 and 22 mcg/L of trichloroethene (USGS, 1989).

The Village of Garden City public water supply well field on Clinton Road has two wells, N3934 and N3935, which were removed from service early in 1987 and 1989, respectively, due to VOC contamination. Samples from the Clinton Road well field contained trichloroethene at the

following maximum concentrations: between 1977 and 1986, well # 3934 contained up to 38 mcg/L; and between 1977 and 1988, well # N3935 contained up to 48 mcg/L (USGS, 1989; NCDH, 2000).

The Village installed an air stripper treatment system at this well field, and service resumed in September 1989. Levels of VOCs in finished water from this well field were detected above drinking water standards in 1993. Blower problems in the air stripper treatment system caused a drinking water standard violation that required public notification on May 1, 1993. The air stripper system was upgraded, and the wells were returned to service in 1994.

Treated water from the Clinton Road well field exceeded drinking water standards again in 1995. Treated water samples collected from well #10 (N3934) on August 14 and August 31st, 1995, contained 13 mcg/L and 12 mcg/L of trichloroethene, respectively. Distribution samples collected on September 12th and 13th, 1995, contained trichloroethene in excess of drinking water standards (up to 120 mcg/L). The Clinton Road well field was removed from service on September 13th, 1995, and the Village issued a water advisory "not to consume water". The Village of Garden City flushed contaminated water from the distribution system by opening interconnections with the water departments of the Villages of Mineola and Hempstead and the hydrants in the eastern section of the Village of Garden City. The Village lifted the water advisory on September 14th, 1995, when analyses confirmed that the treatment system was operating effectively.

In addition to the primary site-related contaminants carbon tetrachloride, 1,1-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, and trichloroethene, other VOCs, including benzene, hexachlorobutadiene, 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, toluene, trichlorofluoromethane were detected in the public water supply wells. Although the presence of these chemicals in the groundwater is not inconsistent with historic use of the site, we do not know if all of the VOC contamination of the public water supply wells is due to the Old Roosevelt Field site.

In August 1993, the NYS DOH and the New York State Department of Environmental Conservation (NYS DEC) analyzed soil gas to determine if contaminants were migrating into the Stewart Avenue and Locust Street Elementary Schools in the Garden City School District. Both schools are downgradient of the Old Roosevelt Air Field Hanger site and other inactive hazardous waste sites, including the Pasley Solvents site. The agencies selected a third school, the Little Village School, for comparison because there is no known groundwater contamination in that area. The agencies collected soil gas samples at a depth of ten feet at each of the schools and tested for chlorinated VOCs and petroleum compounds. The soil gas samples did not contain any of the compounds. These data indicated that chlorinated VOCs and petroleum compounds were not a health concern in soil gas near the Stewart Ave and Locust Street Schools.

On August 25, 1993, the agencies also collected an air sample outside the Locust Street School. VOCs were not detected in the sample. Based on these data, VOC contamination of ambient air was not a public health concern near the Locust Street School.

B. Pathways Analysis

This section of the PHA identifies past, present, and future completed and potential exposure pathways associated with the site. An exposure pathway is the process by which an individual may contact contaminants originating from a site or other source(s). An exposure pathway has five elements, including (1) a contaminant source; (2) environmental media and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

The source of contamination is the origin of the release to the environment (any waste disposal area or point of discharge); if the original source is unknown, it is the environmental media (soil, air, biota, water) which are contaminated at the point of exposure. Environmental media and transport mechanisms "carry" contaminants from the source to points where human exposure may occur. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (i.e., ingestion, inhalation, dermal absorption). The receptor population is the person or people who are exposed to contaminants at a point of exposure.

Human exposure in this document is classified as either one of two types: a completed exposure pathway exists when all five elements of an exposure pathway are documented; a potential exposure pathway exists when the criteria for one of the five elements comprising an exposure pathway are not met. An exposure pathway is considered to be eliminated from any further discussion in this document when any one of the five elements has not existed in the past, does not exist in the present, and is unlikely to exist in the future.

Completed Exposure Pathways

Residents who received public water from the Village of Garden City and those served by the Town of Hempstead Roosevelt Field Water District were exposed to VOC-contaminated water in the past through ingestion, dermal contact, and inhalation, such as when showering. Although contaminants in the Roosevelt Field and Clinton Road public water supply wells were detected above the NYS DOH drinking water standards, actual concentrations in the tap water at homes and businesses were probably less. In most public water distribution systems, water from many different supply wells is mixed. This mixing dilutes the water from contaminated wells with water from clean wells. Therefore, the concentrations of contaminants throughout the Village of Garden City and the Town of Hempstead drinking water distribution systems, including the residential taps, were probably lower than in the contaminated wells.

Potential Exposure Pathway

Ingestion, dermal contact, and inhalation (as when showering) of VOCs could occur in the future if the treatment system at the Clinton Road well field fails. However, monitoring allows for quick responses to treatment failures.

Insufficient Data

The 1993 soil gas and ambient air sampling results indicated that site related chemicals in soil gas and ambient air were not health concerns at the schools studied. The possibility of a soil gas migration pathway cannot be eliminated until the source is identified. Soil vapor intrusion into buildings could be a health concern near the source. Many variables will determine whether soil vapor intrudes buildings such as the types of contaminants, concentration of the contaminants, depths of contaminants, distance to buildings, depth of basements or crawl spaces, etc. The RI will provide information to identify the source. After the source is identified, further soil gas investigation may be necessary.

There are no other exposure pathways associated with this site.

C. Public Health Implications

To evaluate the potential health risks from contaminants associated with the human exposure pathways identified for the Old Roosevelt Air Field Hanger Site, the NYS DOH assessed the risks for cancer and noncancer health effects. The health effects are related to contaminant concentration, exposure pathway, exposure frequency and exposure duration. Chronic exposure to chemicals in drinking water is possible by ingestion, dermal contact and inhalation from water uses such as showering, bathing and cooking. For VOCs, we assume people are exposed to the same amount of contaminants through inhalation and dermal contact as they are through drinking water. Although exposure varies depending on an individual's lifestyle, each of these exposure routes can contribute to the overall daily intake of contaminants and, thus, may increase the risk for chronic health effects. For additional information on how the NYS DOH determined and qualified health risks applicable to this health assessment, refer to Appendix C.

Past ingestion, dermal and inhalation exposure to VOCs in the Roosevelt Field Water District public water supply wells

Two public drinking water supply wells in the Roosevelt Field Water District (Town of Hempstead) have been contaminated with VOCs. The Roosevelt Air Field Hanger site was used for civilian and military aviation activities from 1911 to 1951. The amount of time the water supplies have been contaminated and how long people may have been exposed is not known. The highest detected levels of benzene (15 mcg/L), carbon tetrachloride (35 mcg/L), cis-1,2-dichloroethene (12 mcg/L), hexachlorobutadiene (8 mcg/L), tetrachloroethene (26 mcg/L), 1,2,3-trichlorobenzene (8 mcg/L), 1,2,4-trichlorobenzene (8 mcg/L), and trichloroethene (170

mcg/L) in the public water supply wells exceed current New York State public drinking water standards and/or public health assessment comparison values (Table 2). The highest detected level of toluene (5 mcg/L) is the same as its public drinking water standard.

Benzene is a known human carcinogen (ATSDR, 1997a). Studies of workers exposed to trichloroethene and/or tetrachloroethene and other chemicals show an association between exposure to high levels of these chemicals and increased risks of certain forms of cancer, including kidney, bladder, cervical, esophageal, liver and non-Hodgkin's lymphoma (ATSDR, 1997b,c). The role of other factors in causing these cancers, including exposures to other potential cancer-causing chemicals, is not fully known. Thus, these data suggest, but do not prove, that trichloroethene and tetrachloroethene cause cancer in humans. Other studies show that people living in communities with drinking water supplies contaminated by mixtures of chemicals including trichloroethene and tetrachloroethene, have higher risks of certain types of cancer (e.g., non-Hodgkin's lymphoma) than do people living in communities with uncontaminated drinking water. These studies are weaker than those of workers largely because in most of the studies we cannot be certain whether the people who got cancer actually drank the contaminated water for long periods of time before they got cancer.

Trichloroethene, tetrachloroethene, carbon tetrachloride and hexachlorobutadiene cause cancer in laboratory animals given large doses over their lifetimes (ATSDR, 1994a,b; 1997b,c). Chemicals that cause cancer in laboratory animals may also increase the risk of cancer in humans who are exposed to lower levels over long periods of time. Whether carbon tetrachloride and hexachlorobutadiene cause cancer in humans is unknown (ATSDR, 1994a,b). Toxicological data are inadequate to assess the carcinogenic potential of cis-1,2-dichloroethene, toluene, 1,2,3-trichlorobenzene and 1,2,4-trichlorobenzene (ATSDR, 1996, 1998b). Based on the human and animals studies and limited sampling of the public water supply wells, people drinking water from the Roosevelt Field Water District containing the highest detected levels of benzene (15 mcg/L), carbon tetrachloride (35 mcg/L), hexachlorobutadiene (8 mcg/L), tetrachloroethene (26 mcg/L) and trichloroethene (170 mcg/L) for a period of 30 years [the US EPA's 95th percentile value for the length of time a person resides in a single household (US EPA, 1999)] could have a low increased risk of developing cancer. The actual cancer risk for exposure to these chemicals in drinking water cannot be estimated because of the lack of information on past exposures because no sampling data exist prior to 1977 and the amount of time the contaminants have been present is unknown.

Benzene, carbon tetrachloride, cis-1,2-dichloroethene, hexachlorobutadiene, tetrachloroethene, toluene, 1,2,4-trichlorobenzene, and trichloroethene also produce a variety of noncarcinogenic health effects, primarily on the liver, kidneys and nervous system (ATSDR 1994a,b; 1996; 1997a,b,c; 1998b). Benzene and cis-1,2-dichloroethene also cause adverse effects on the blood (ATSDR 1996; 1997a). Although the risks of noncarcinogenic effects from past exposures to these contaminants in public drinking water supplies are not completely understood, the existing data suggest that they are low for carbon tetrachloride, hexachlorobutadiene and trichloroethene, and

minimal for benzene, cis-1,2-dichloroethene, tetrachloroethene, toluene, and 1,2,4-trichlorobenzene. Toxicological data are inadequate to assess the noncarcinogenic effects of 1,2,3-trichlorobenzene.

Past ingestion, dermal and inhalation exposure to VOCs in the Garden City Water District public water supply wells

Two Village of Garden City public drinking water supply wells (Town of Hempstead) have been contaminated with VOCs for an undetermined period of time. The highest detected levels of carbon tetrachloride (6 mcg/L), hexachlorobutadiene (8 mcg/L), 1,2,3-trichlorobenzene (8 mcg/L), trichloroethene (48 mcg/L) and trichlorofluoromethane (120 mcg/L) in the public water supply wells exceed current New York State public drinking water standards and/or public health assessment comparison values (Table 2). The highest detected levels of benzene (5 mcg/L), tetrachloroethene (5 mcg/L), toluene (5 mcg/L), and 1,2,4-trichlorobenzene (5 mcg/L) are the same as their public drinking water standard.

The health effects of benzene, carbon tetrachloride, hexachlorobutadiene, tetrachloroethene, toluene, 1,2,4-trichlorobenzene and trichloroethene have already been discussed above. Based on the human and animal studies and on limited sampling of the public wells, people drinking water in the Garden City Water District containing the highest detected levels of benzene (5 mcg/L), carbon tetrachloride (6 mcg/L), hexachlorobutadiene (8 mcg/L), tetrachloroethene (5 mcg/L), and trichloroethene (48 mcg/L) for a period of 30 years (the US EPA's 95th percentile value for the length of time a person resides in a single household (US EPA, 1999)) could have a low increased risk of developing cancer. Again, the actual cancer risk for exposure to these chemicals in drinking water cannot be estimated because of the lack of information on past exposures. The risks for noncarcinogenic effects for exposure to the chemicals detected in the Village of Garden City public water supply would be low for hexachlorobutadiene and would be minimal for benzene, carbon tetrachloride, tetrachloroethene, toluene, 1,2,4-trichlorobenzene, trichloroethene and trichlorofluoromethane.

D. Health Outcome Data

The NYS DOH has not evaluated health outcome data specifically for this site. The NYS DOH is developing a registry of individuals in New York State who have been exposed to VOCs in drinking water.

In 1999, the NYS DOH established the New York State Volatile Organic Compounds (VOC) Exposure Registry as a tool for health status assessment and long-term follow-up for communities with documented exposures to VOCs. The Registry is currently evaluating exposures and health status of New York State residents at locations where drinking water or indoor air was contaminated with chemicals such as industrial solvents or petroleum products from landfills,

industrial sites, spills, or other sources. Individuals and communities are selected for inclusion in the Registry if potential exposures from the contamination of private wells, public water supplies, or indoor air have been verified by sampling results. Future analyses, based on VOC Exposure Registry information, may increase understanding of potential health effects from exposures similar to those experienced by residents at Old Roosevelt Field.

For communities with large public water supplies served by multiple wells, information is generally not available for accurately specifying VOC exposures for individual households. In addition, in cases where exposures ended more than ten years ago, it would be difficult now to locate the residents who lived in the area at the time of the potential exposures. For these reasons, residents supplied by public water supplies affected by contamination from the Old Roosevelt Air Field Hanger Site are not being considered for inclusion in the VOC Registry. The VOC Exposure Registry may help contribute to knowledge about whether specific health outcomes may be related to exposures to the specific chemicals, particularly trichloroethene and tetrachloroethene, that are associated with the ORCA site.

E. ATSDR Child Health Considerations

The ATSDR Child Health Initiative emphasizes examining child health issues in all of the agency activities, including evaluating child-focused concerns through its mandated public health assessment activities. The ATSDR and the NYS DOH considers children when evaluating exposure pathways and potential health effects from environmental contaminants. We recognize that children are of special concern because of their greater potential for exposure from play and other behavior patterns. Children sometimes differ from adults in their susceptibility to hazardous chemicals, but whether there is a difference depends on the chemical. Children may be more or less susceptible than adults to health effects from a chemical and the relationship may change with developmental age.

The possibility that children or the developing fetus may have increased sensitivity to trichloroethene, tetrachloroethene and carbon tetrachloride (three of the primary contaminants at the Old Roosevelt Field site) was taken into account when evaluating the potential health risks associated with the site. Human studies suggest that exposure to mixtures of chlorinated solvents (including trichloroethene, tetrachloroethene and carbon tetrachloride) in drinking water during pregnancy may increase the risk of birth defects (e.g., neural tube defects, oral cleft defects, and congenital heart defects) and/or childhood leukemia (ATSDR, 1994a; 1997b,c). In each of these studies, however, there are uncertainties about how much contaminated water the women drank during pregnancy and about how much trichloroethene, tetrachloroethene and carbon tetrachloride was in the water the women drank during pregnancy. Moreover, the role of other factors in causing these effects is not fully known. One important factor was the potential exposure during pregnancy to other chemicals in drinking water. These studies suggest, but do not prove, that the

developing fetus may have increased sensitivity to the effects of trichloroethene, tetrachloroethene and carbon tetrachloride.

When pregnant animals are exposed by ingestion and/or inhalation to large amounts of trichloroethene or tetrachloroethene, adverse effects on the normal development of the offspring are observed. In most, but not all of these studies, the high amounts of trichloroethene or tetrachloroethene also caused adverse health effects on the parent animal. A study in young mice suggests effects on the central nervous system after transient exposure to tetrachloroethene by ingestion 10 to 16 days after birth (Fredriksson et al., 1993). In another study, abnormal fetal heart development was observed in the offspring of rats exposed to trichloroethene in drinking water before and during pregnancy (Dawson et al., 1993). When compared to the levels of exposure that cause developmental effects in animals, the estimated levels of exposure to tetrachloroethene and trichloroethene in public water supplies near the Old Roosevelt Field site are at least 18 times lower. The actions taken to reduce exposure to chlorinated solvents in the drinking water supply wells will help ensure that the potential risks are minimized.

COMMUNITY HEALTH CONCERNS

No public meetings have been held for the Old Roosevelt Air Field Hanger or ORCA sites. However, representatives of local environmental groups expressed concerns about groundwater contamination migrating from the site. In August 1994, at a public meeting for the Garden City Park Industrial Area site, representatives of the local environmental groups asked about the progress of investigations at the Old Roosevelt Air Field Hanger site. The US EPA began an RI in early 2003.

Citizens Campaign for the Environment, an environmental organization, prepared a report in response to a Public Health Assessment written by the NYS DOH for the former Pasley Solvent site, which is about one-half mile from the Old Roosevelt Air Field Hanger site. This report discussed the major groundwater contamination plumes in Nassau County and identified the Old Roosevelt Air Field Hanger site as one of many groundwater contaminant sources to the two aquifers that supply water to Nassau County residents. The RI will examine the nature and extent of the contamination of the ORCA.

Area residents also expressed concerns about contaminated groundwater at the Town of Hempstead well field in Uniondale. Well numbers N8474 and N8475 were removed from service due to VOC contamination on July 19, 1994, before the contamination exceeded drinking water standards. These wells were returned to service in 1996 with granulated activated carbon treatment to remove the VOCs.

The NYS DOH and ATSDR solicited information about the concerns of community members at future public meetings. NYS DOH held a 30 day public comment period after the initial release of this document between March 18 and June 16, 2002. The NYS DOH received comment forms from

three residents. Two had no comments and the third discussed confidential personal health issues. No changes in the PHA were made based on the public review of the document. However, the PHA was updated and some editorial changes were made for clarification.

CONCLUSIONS

Because people were exposed to VOCs in the public drinking water supplies at levels above the Federal and State drinking water standards, public health actions were required to reduce the exposures including treating the water or closing some wells. Human exposure to these contaminants in drinking water occurred via ingestion, inhalation and dermal contact. These exposures could have occurred for some unknown time period prior to 1976 until 1980, or for some individuals, up to 1989. The chance that someone would actually get cancer from their past exposures is low, while the chance that someone would get a non-cancer adverse health effect is minimal or low, depending on which ORCA chemical(s) he or she was exposed. See the Public Health Implications section of this document for the risk associated with the individual chemicals found in the ORCA.

Levels of contamination present in drinking water prior to 1976 are not known. The NCDH initially documented the contaminated groundwater 1976. The Town of Hempstead and the Village of Garden City closed public drinking water supply wells that were contaminated above drinking water standards. The Village of Garden City first installed treatment systems on the Clinton Road wells in 1988.

Although samples from the Roosevelt Field and Clinton Road public water supply wells contained VOCs at levels above the current NYS DOH drinking water standards, actual concentrations in residential tap water were probably less. In most public water supply distribution systems, water from many supply wells is mixed. This mixing dilutes the water from contaminated wells with water from clean wells. Therefore, the concentrations of contaminants throughout the Town of Hempstead and Village of Garden City drinking water distribution systems, including the residential taps, were probably lower than in the contaminated wells. However, without historic data showing the extent of the dilution, NYS DOH assumed as a "worst case" scenario (i.e., NYS DOH assumed that some individuals received water at the maximum contaminant concentration detected. This means that the NYS DOH used the maximum contaminant concentration detected to determine health risks associated with this site).

Based on the public health hazard category classification used by the ATSDR (Appendix C), the ORCA site currently poses no apparent public health hazard because treatment systems have been installed on the contaminated public water supplies to remove VOCs. The Garden City public supply wells on Clinton Road are regularly sampled by the Village water district to ensure that only drinking water that meets standards is distributed to the public.

RECOMMENDATIONS

- The affected and potentially affected public water supply wells and treatment systems in the Old Roosevelt Air Field Hanger area should continue to be monitored to help minimize exposure to contaminants. The treatment systems should remain in use until the raw groundwater quality in the affected wells is less than the state's drinking water standards for VOCs.
- Monitoring wells between the suspected source area of the Old Roosevelt Air Field Hanger site and the potentially affected water supply wells should be sampled periodically. The samples should be analyzed for site related contaminants to determine if the plume has advanced and contaminated more wells.
- The NYS DOH should review the results of the remedial investigation of the ORCA to determine if additional measures are needed to protect public health.

PUBLIC HEALTH ACTION PLAN

Public Health Actions Taken

1. All water supply wells in Nassau County, including those potentially affected by the ORCA plume, are routinely monitored by the water suppliers for the contaminants detected in the Old Roosevelt Air Field Hanger site plume. The results are reviewed by the NCHD. When violations of standards or guidelines occurred, the wells were taken out of service, abandoned, or supplied with treatment systems to bring finished water within standards.
2. Soil gas samples were collected by the NYS DEC near elementary schools that are located in the area potentially affected by the Old Roosevelt Air Field Hanger plume. Results showed that exposure to VOCs by soil gas migration is not a public health concern in the areas investigated.
3. In 1998, the NYS DOH and ATSDR released the Old Roosevelt Air Field Hanger Site Health Consultation (ATSDR, 1998a). The health consultation was written at the request of area residents and environmental groups. It reviewed environmental data available at that time and evaluated the potential for human exposure to contamination through dermal contact, ingestion or inhalation. The NYS DOH and ATSDR assessed community concerns and made recommendations. For example, the 1998 health consultation recommends continued monitoring of wells affected by, or potentially affected by, the contaminant plume.

Public Health Actions Planned (PHAP)

1. The NCHD will continue to review water quality data collected by the Village of Garden City and the Town of Hempstead Roosevelt Field Water District for all wells including those affected by the ORCA. Monitoring for affected wells occurs on a quarterly basis.
2. The NYS DOH will review the results of the RI to determine what, if any, further remediation is needed to protect human health.
3. The ATSDR and the NYS DOH will coordinate with the appropriate agencies regarding actions to be taken in response to those recommendations provided in this health consultation for which no plan of action has yet been developed.
4. The ATSDR will provide follow-up to the PHAP as needed, outlining the actions completed and those in progress. Follow-up reports will be placed in repositories that contain copies of this health consultation, and will be provided to persons who request it.

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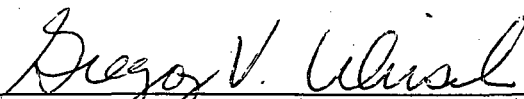
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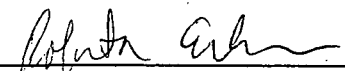
CERTIFICATION

This Public Health Assessment was prepared by the New York State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated.



Technical Project Officer, CAT, SSAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this public health assessment, and concurs with its findings.



Team Leader, CAT, SSAB, DHAC

APPENDIX A

Figures

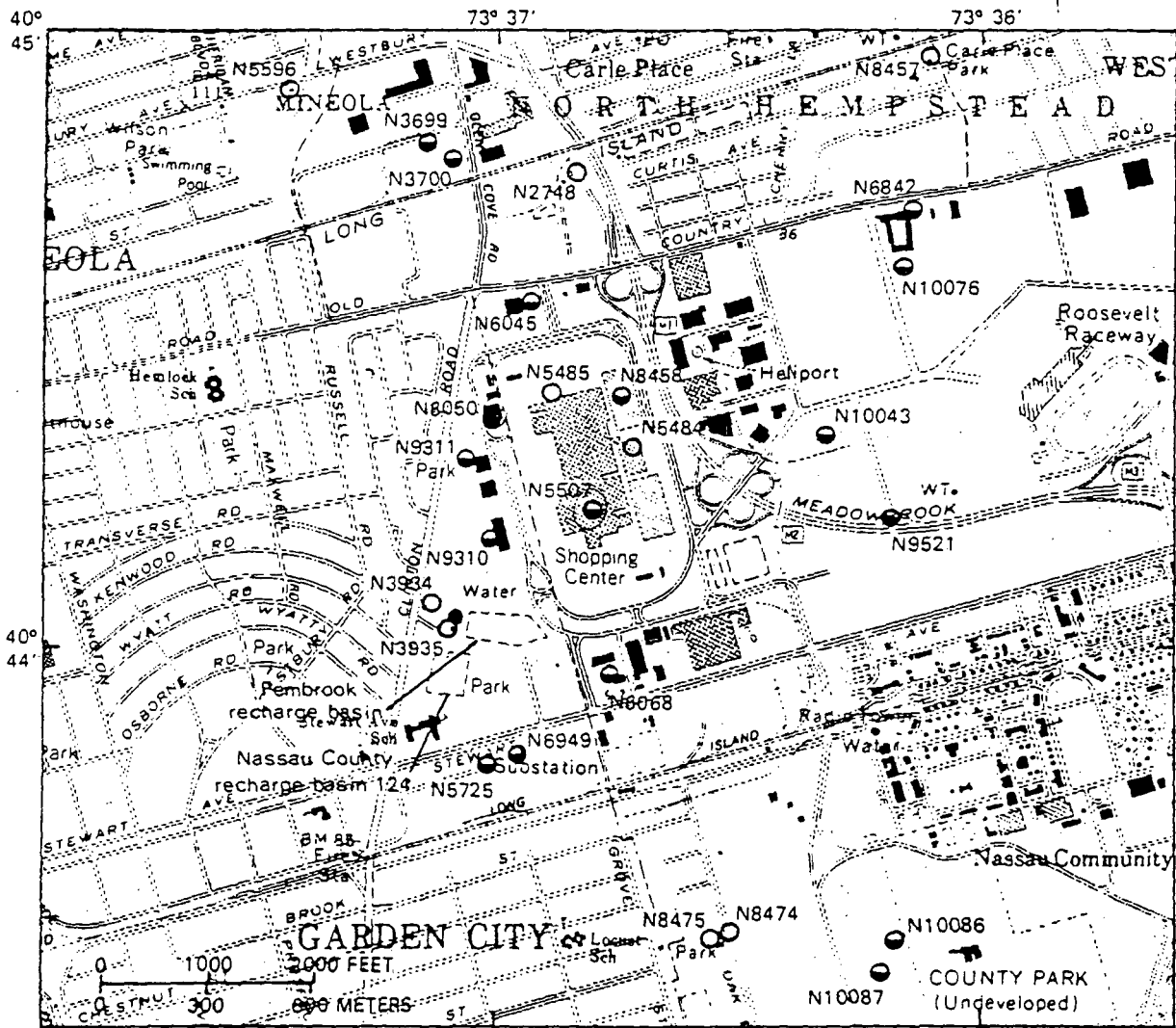
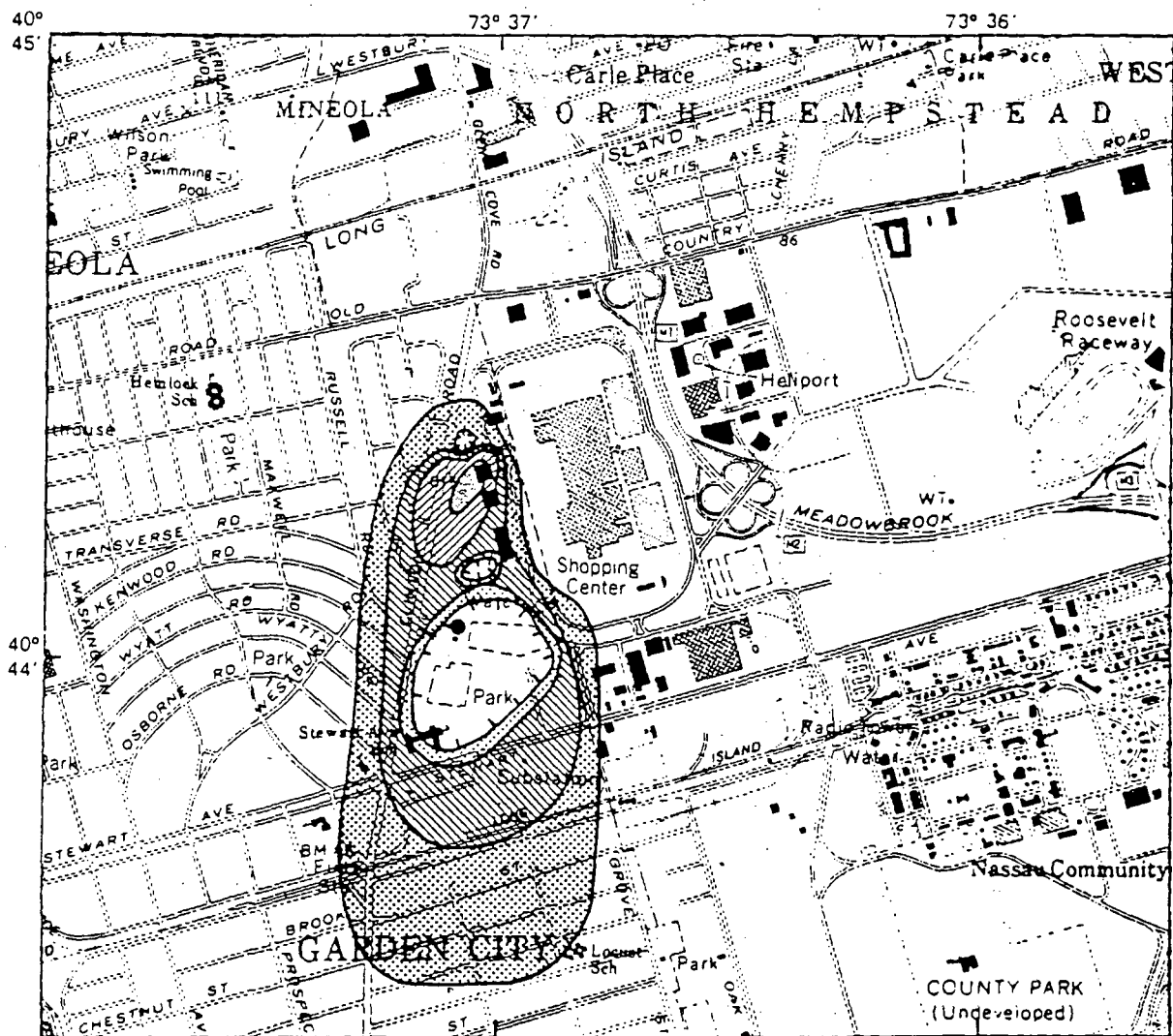


Figure 1 – Site Location Map:

Shopping mall currently located on the former Old Roosevelt Air Field Hanger Site. (USGS, 1989)



Base from NYSDOT, Freeport, NY, 1981; Lynbrook, NY, 1981;
Sea Cliff, NY, 1981; and Hicksville, NY, 1981, 1:24,000

0 1000 2000 FEET
0 300 600 METERS

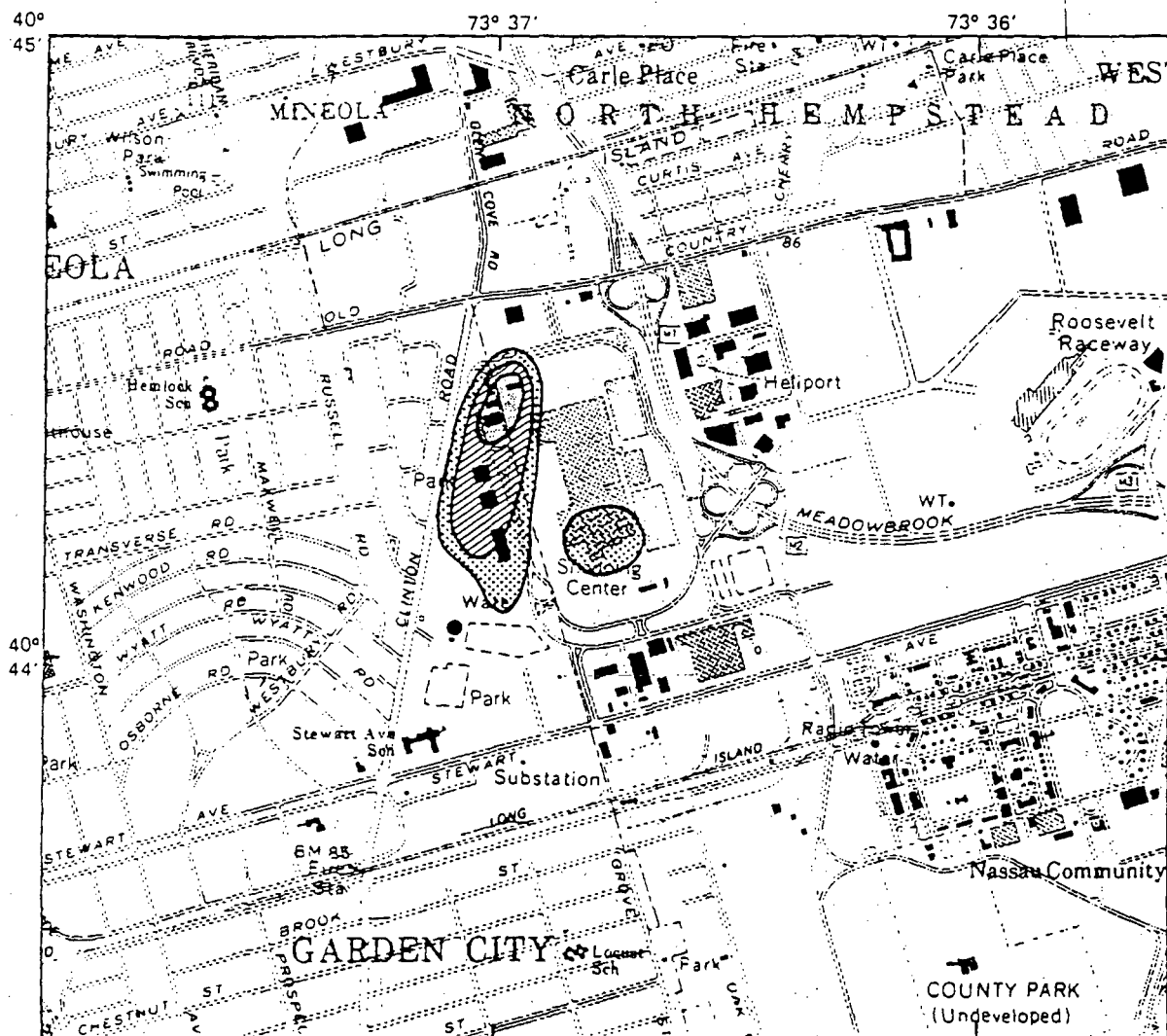
EXPLANATION

CONCENTRATION, IN MICROGRAMS PER LITER

50 to 100	250 to 500
100 to 250	More than 500

Figure 2 – The Old Roosevelt Field Contaminated Groundwater Area (ORCA):

Trichloroethylene concentration in the upper glacial aquifer at Roosevelt Field, April – May 1984, before start of seasonal cooling-water pumping. (USGS, 1989)



Base from NYSDOT, Freeport, NY, 1981; Lynbrook, NY, 1981;
Sea Cliff, NY, 1981; and Hicksville, NY, 1981, 1:24,000

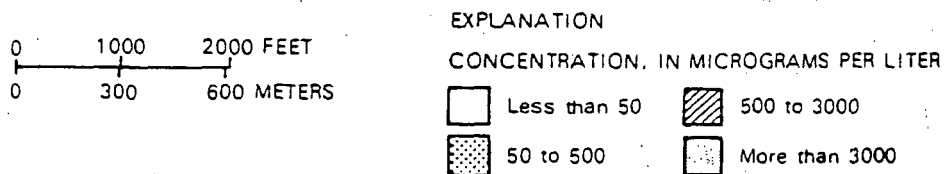


Figure 3 - The Old Roosevelt Field Contaminated Groundwater Area (ORCA):

Trichloroethylene concentrations in the Magothy aquifer at Roosevelt Field, April - May 1984, before start of seasonal cooling-water pumping. (SGS, 1989).

APPENDIX B

Tables

Table 1.

Maximum Trichloroethene Concentrations in Public Water Supply Wells (Before Closure or Treatment)
Affected by the Old Roosevelt Field Contaminated Groundwater Area.

	N5484	N5485	N5486	N3934	N3935
Local Well #	1	2	3	10	11
Water District	Town of Hempstead	Town of Hempstead	Town of Hempstead	Garden City	Garden City
Well Field	Roosevelt	Roosevelt	Roosevelt	Clinton Street	Clinton Street
Trichloroethene Maximum Concentration between 1977 and 1980 (mcg/L)	-	-	170	-	-
Trichloroethene Maximum Concentration between 1977 and 1986 (mcg/L)	-	100	-	-	-
Trichloroethene Maximum Concentration between 1977 and 1988 (mcg/L)	16	-	-	-	-
Trichloroethene Maximum Concentration between 1977 and 1986 ¹ (mcg/L)	-	-	-	38	-
Trichloroethene Maximum Concentration between 1977 and 1988 ² (mcg/L)	-	-	-	-	48

1. Well # N3934 was taken off-line in 1987 and returned to service after the treatment system was installed in late 1989.
2. Well # N3935 was taken off-line in 1989 and returned to service after the treatment system was installed later in 1989.

Table 2

**Water Quality Standards/Guidelines and /or Public Health Assessment Comparison Values
Exceeded by Contaminants Found in Public Drinking Water Supplies in Roosevelt Field and Garden City Water Districts
[All values in micrograms per liter (mcg/L)]**

Contaminant	Water Quality Standards/Guidelines				Noncan			
	New York State			US EPA	Cancer	Basis**		Basis**
	Ground Water	Surface Water	Drinking Water	Drinking Water				
benzene	1	1	5	5	0.64	EPA CPF	21	EPA RBC
carbon tetrachloride	5	0.4 ^a	5	5	0.27	EPA CPF	4.9	EPA RfD
cis-1,2-dichloroethene	5	5	5	70	--	--	70	EPA HEAST
hexachlorobutadiene	0.5	0.5	5	--	0.45	EPA CPF	1	EPA LTHA
tetrachloroethene	5	0.7 ^a	5	5	0.7	EPA RBC	10	EPA LTHA
toluene	5	5	5	1,000	--	--	1000	EPA LTHA
1,2,3-trichlorobenzene	5	5 ^a	5	--	--	--	10	-- ^b
1,2,4-trichlorobenzene	5	5 ^a	5	70	--	--	10	EPA LTHA
trichloroethene	5	5	5	5	3.2	EPA RBC	42	EPA RBC
trichlorofluoromethane	5	5	5	--	--	--	2,000	EPA LTHA

^a Guidance value.

^b Based on 1,2,4-trichlorobenzene LTHA.

* Comparison values determined for a 70 kilogram adult who drinks 2 liters of water per day. A 20% relative source contribution is assumed for organic chemicals for noncancer comparison values.

** EPA CPF Environmental Protection Agency cancer potency factor

EPA HEAST Environmental Protection Agency health effects assessment summary tables

EPA LTHA Environmental Protection Agency lifetime health advisories

EPA RfD Environmental Protection Agency reference dose

EPA RBC Environmental Protection Agency risk based concentration

APPENDIX C

New York State Department of Health
Procedures for Evaluating Potential
Health Risks for Contaminants of Concern

NYS DOH PROCEDURE FOR EVALUATING POTENTIAL HEALTH RISKS FOR CONTAMINANTS OF CONCERN

To evaluate the potential health risks from contaminants of concern associated with the Old Roosevelt Field Contaminated Groundwater Area, the New York State Department of Health assessed the risks for cancer and noncancer health effects.

Increased cancer risks were estimated by using site-specific information on exposure levels for the contaminant of concern and interpreting them using cancer potency estimates derived for that contaminant by the US EPA or, in some cases, by the NYS DOH. The following qualitative ranking of cancer risk estimates, developed by the NYS DOH, was then used to rank the risk from very low to very high. For example, if the qualitative descriptor was "low", then the excess lifetime cancer risk from that exposure is in the range of greater than one per million to less than one per ten thousand. Other qualitative descriptors are listed below:

Excess Lifetime Cancer Risk

<u>Risk Ratio</u>	<u>Qualitative Descriptor</u>
equal to or less than one per million	very low
greater than one per million to less than one per ten thousand	low
one per ten thousand to less than one per thousand	moderate
one per thousand to less than one per ten	high
equal to or greater than one per ten	very high

An estimated increased excess lifetime cancer risk is not a specific estimate of expected cancers. Rather, it is a plausible upper bound estimate of the probability that a person may develop cancer sometime in his or her lifetime following exposure to that contaminant.

There is insufficient knowledge of cancer mechanisms to decide if there exists a level of exposure to a cancer-causing agent below which there is no risk of getting cancer, namely, a threshold level. Therefore, every exposure, no matter how low, to a cancer-causing compound is assumed to be associated with some increased risk. As the dose of a carcinogen decreases, the chance of developing cancer decreases, but each exposure is accompanied by some increased risk.

There is general consensus among the scientific and regulatory communities on what level of estimated excess cancer risk is acceptable. An increased lifetime cancer risk of one in one million or less is generally not considered a significant public health concern.

For noncarcinogenic health risks, the contaminant intake was estimated using exposure assumptions for the site conditions. This dose was then compared to a risk reference dose (estimated daily intake of a chemical that is likely to be without an appreciable risk of health effects) developed by the US EPA,

ATSDR and/or NYS DOH. The resulting ratio was then compared to the following qualitative scale of health risk:

Qualitative Descriptions for
Noncarcinogenic Health Risks

<u>Ratio of Estimated Contaminant Intake to Risk Reference Dose</u>	<u>Qualitative Descriptor</u>
equal to or less than the risk reference dose	minimal
greater than one to five times the risk reference dose	low
greater than five to ten times the risk reference dose	moderate
greater than ten times the risk reference dose	high

Noncarcinogenic effects unlike carcinogenic effects are believed to have a threshold, that is, a dose below which adverse effects will not occur. As a result, the current practice is to identify, usually from animal toxicology experiments, a no-observed-effect-level (NOEL). This is the experimental exposure level in animals at which no adverse toxic effect is observed. The NOEL is then divided by an uncertainty factor to yield the risk reference dose. The uncertainty factor is a number which reflects the degree of uncertainty that exists when experimental animal data are extrapolated to the general human population. The magnitude of the uncertainty factor takes into consideration various factors such as sensitive subpopulations (for example, children or the elderly), extrapolation from animals to humans, and the incompleteness of available data. Thus, the risk reference dose is not expected to cause health effects because it is selected to be much lower than dosages that do not cause adverse health effects in laboratory animals.

The measure used to describe the potential for noncancer health effects to occur in an individual is expressed as a ratio of estimated contaminant intake to the risk reference dose. A ratio equal to or less than one is generally not considered a significant public health concern. If exposure to the contaminant exceeds the risk reference dose, there may be concern for potential noncancer health effects because the margin of protection is less than that afforded by the reference dose. As a rule, the greater the ratio of the estimated contaminant intake to the risk reference dose, the greater the level of concern. This level of concern depends upon an evaluation of a number of factors such as the actual potential for exposure, background exposure, and the strength of the toxicologic data.

APPENDIX D

Public Health Hazard Categories

INTERIM PUBLIC HEALTH HAZARD CATEGORIES

CATEGORY / DEFINITION	DATA SUFFICIENCY	CRITERIA
A. Urgent Public Health Hazard This category is used for sites where short-term exposures (< 1 yr) to hazardous substances or conditions could result in adverse health effects that require rapid intervention.	This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that site-specific conditions or likely exposures have had, are having, or are likely to have in the future, an adverse impact on human health that requires immediate action or intervention. Such site-specific conditions or exposures may include the presence of serious physical or safety hazards.
B. Public Health Hazard This category is used for sites that pose a public health hazard due to the existence of long-term exposures (> 1 yr) to hazardous substance or conditions that could result in adverse health effects.	This determination represents a professional judgement based on critical data which ATSDR has judged sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* suggests that, under site-specific conditions of exposure, long-term exposures to site-specific contaminants (including radionuclides) have had, are having, or are likely to have in the future, an adverse impact on human health that requires one or more public health interventions. Such site-specific exposures may include the presence of serious physical or safety hazards.
C. Indeterminate Public Health Hazard This category is used for sites in which "critical" data are <i>insufficient</i> with regard to extent of exposure and/or toxicologic properties at estimated exposure levels.	This determination represents a professional judgement that critical data are missing and ATSDR has judged the data are insufficient to support a decision. This does not necessarily imply all data are incomplete; but that some additional data are required to support a decision.	The health assessor must determine, using professional judgement, the "criticality" of such data and the likelihood that the data can be obtained and will be obtained in a timely manner. Where some data are available, even limited data, the health assessor is encouraged to the extent possible to select other hazard categories and to support their decision with clear narrative that explains the limits of the data and the rationale for the decision.
D. No Apparent Public Health Hazard This category is used for sites where human exposure to contaminated media may be occurring, may have occurred in the past, and/or may occur in the future, but the exposure is not expected to cause any adverse health effects.	This determination represents a professional judgement based on critical data which ATSDR considers sufficient to support a decision. This does not necessarily imply that the available data are complete; in some cases additional data may be required to confirm or further support the decision made.	Evaluation of available relevant information* indicates that, under site-specific conditions of exposure, exposures to site-specific contaminants in the past, present, or future are not likely to result in any adverse impact on human health.
E: No Public Health Hazard This category is used for sites that, because of the absence of exposure, do NOT pose a public health hazard.	Sufficient evidence indicates that no human exposures to contaminated media have occurred, none are now occurring, and none are likely to occur in the future	

*Such as environmental and demographic data; health outcome data; exposure data; community health concerns information; toxicologic, medical, and epidemiologic data; monitoring and management plans.

800038

APPENDIX E

Glossary

**ATSDR Plain Language Glossary
of Environmental Health Terms**
Revised -15Dec99

- Absorption:** How a chemical enters a person's blood after the chemical has been swallowed, has come into contact with the skin, or has been breathed in.
- Acute Exposure:** Contact with a chemical that happens once or only for a limited period of time. ATSDR defines acute exposures as those that might last up to 14 days.
- Additive Effect:** A response to a chemical mixture, or combination of substances, that might be expected if the known effects of individual chemicals, seen at specific doses, were added together.
- Adverse Health Effect:** A change in body function or the structures of cells that can lead to disease or health problems.
- Antagonistic Effect:** A response to a mixture of chemicals or combination of substances that is **less** than might be expected if the known effects of individual chemicals, seen at specific doses, were added together.
- ATSDR:** The Agency for Toxic Substances and Disease Registry. ATSDR is a federal health agency in Atlanta, Georgia that deals with hazardous substance and waste site issues. ATSDR gives people information about harmful chemicals in their environment and tells people how to protect themselves from coming into contact with chemicals.
- Background Level:** An average or expected amount of a chemical in a specific environment. Or, amounts of chemicals that occur naturally in a specific environment.
- Biota:** Used in public health, things that humans would eat – including animals, fish and plants.
- CAP:** See Community Assistance Panel.
- Cancer:** A group of diseases which occur when cells in the body become abnormal and grow, or multiply, out of control.
- Carcinogen:** Any substance shown to cause tumors or cancer in experimental studies.
- CERCLA:** See Comprehensive Environmental Response, Compensation, and Liability Act.
- Chronic Exposure:** A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than one year to be *chronic*.
- Completed Exposure Pathway:** See Exposure Pathway.
- Community Assistance Panel (CAP):** A group of people from the community and health and environmental agencies who work together on issues and problems at hazardous waste sites.

**Comparison Value:
(CVs)**

Concentrations or the amount of substances in air, water, food, and soil that are unlikely, upon exposure, to cause adverse health effects. Comparison values are used by health assessors to select which substances and environmental media (air, water, food and soil) need additional evaluation while health concerns or effects are investigated.

**Comprehensive Environmental
Response, Compensation, and Liability**

Act (CERCLA): CERCLA was put into place in 1980. It is also known as **Superfund**. This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites. ATSDR was created by this act and is responsible for looking into the health issues related to hazardous waste sites.

Concern: A belief or worry that chemicals in the environment might cause harm to people.

Concentration: How much or the amount of a substance present in a certain amount of soil, water, air, or food.

Contaminant: See **Environmental Contaminant**.

Delayed Health Effect: A disease or injury that happens as a result of exposures that may have occurred far in the past.

Dermal Contact: A chemical getting onto your skin. (see **Route of Exposure**).

Dose: The amount of a substance to which a person may be exposed, usually on a daily basis. Dose is often explained as "amount of substance(s) per body weight per day".

Dose / Response: The relationship between the amount of exposure (dose) and the change in body function or health that result.

Duration: The amount of time (days, months, years) that a person is exposed to a chemical.

Environmental Contaminant: A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in **Background Level**, or what would be expected.

Environmental Media: Usually refers to the air, water, and soil in which chemicals of interest are found. Sometimes refers to the plants and animals that are eaten by humans. **Environmental Media** is the second part of an **Exposure Pathway**.

**U.S. Environmental
Protection**

Agency (EPA): The federal agency that develops and enforces environmental laws to protect the environment and the public's health.

Epidemiology: The study of the different factors that determine how often, in how many people, and in which people will disease occur.

Exposure: Coming into contact with a chemical substance. (For the three ways people can come in contact with substances, see **Route of Exposure**.)

Exposure Assessment: The process of finding the ways people come in contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.

Exposure Pathway: A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical. ATSDR defines an exposure pathway as having 5 parts:

1. Source of Contamination,
2. Environmental Media and Transport Mechanism,
3. Point of Exposure,
4. Route of Exposure, and
5. Receptor Population.

When all 5 parts of an exposure pathway are present, it is called a **Completed Exposure Pathway**. Each of these 5 terms is defined in this Glossary.

Frequency: How often a person is exposed to a chemical over time; for example, every day, once a week, twice a month.

Hazardous Waste: Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.

Health Effect: ATSDR deals only with **Adverse Health Effects** (see definition in this Glossary).

Indeterminate Public Health Hazard: The category is used in Public Health Assessment documents for sites where important information is lacking (missing or has not yet been gathered) about site-related chemical exposures.

Ingestion: Swallowing something, as in eating or drinking. It is a way a chemical can enter your body (See **Route of Exposure**).

Inhalation: Breathing. It is a way a chemical can enter your body (See **Route of Exposure**).

LOAEL: **Lowest Observed Adverse Effect Level.** The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.

Malignancy: See **Cancer**.

MRL: **Minimal Risk Level.** An estimate of daily human exposure -- by a specified route and length of time -- to a dose of chemical that is likely to be without a measurable risk of adverse, noncancerous effects. An MRL should not be used as a predictor of adverse health effects.

NPL: The **National Priorities List**. (Which is part of **Superfund**.) A list kept by the U.S. Environmental Protection Agency (EPA) of the most serious, uncontrolled or abandoned hazardous waste sites in the country. An NPL site needs to be cleaned up or is being looked at to see if people can be exposed to chemicals from the site.

NOAEL:	No Observed Adverse Effect Level. The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.
No Apparent Public Health Hazard:	The category is used in ATSDR's Public Health Assessment documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring but the exposures are not at levels expected to cause adverse health effects.
No Public Health Hazard:	The category is used in ATSDR's Public Health Assessment documents for sites where there is evidence of an absence of exposure to site-related chemicals.
PHA:	Public Health Assessment. A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.
Plume:	A line or column of air or water containing chemicals moving from the source to areas further away. A plume can be a column or clouds of smoke from a chimney or contaminated underground water sources or contaminated surface water (such as lakes, ponds and streams).
Point of Exposure:	The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). For examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.
Population:	A group of people living in a certain area; or the number of people in a certain area.
PRP:	Potentially Responsible Party. A company, government or person that is responsible for causing the pollution at a hazardous waste site. PRP's are expected to help pay for the clean up of a site.
Public Health Assessment(s):	See PHA .
Public Health Hazard:	The category is used in PHAs for sites that have certain physical features or evidence of chronic, site-related chemical exposure that could result in adverse health effects.
Public Health Hazard Criteria:	PHA categories given to a site which tell whether people could be harmed by conditions present at the site. Each are defined in the Glossary. The categories are: <ul style="list-style-type: none"> - Urgent Public Health Hazard - Public Health Hazard - Indeterminate Public Health Hazard - No Apparent Public Health Hazard - No Public Health Hazard
Receptor Population:	People who live or work in the path of one or more chemicals, and who could come into contact with them (See Exposure Pathway).

Reference Dose (RfD):

An estimate, with safety factors (see **safety factor**) built in, of the daily, life-time exposure of human populations to a possible hazard that is not likely to cause harm to the person.

Route of Exposure: The way a chemical can get into a person's body. There are three exposure routes:

- breathing (also called inhalation),
- eating or drinking (also called ingestion), and
- or getting something on the skin (also called dermal contact).

Safety Factor: Also called **Uncertainty Factor**. When scientists don't have enough information to decide if an exposure will cause harm to people, they use "safety factors" and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

SARA: The Superfund Amendments and Reauthorization Act in 1986 amended CERCLA and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from chemical exposures at hazardous waste sites.

Sample Size: The number of people that are needed for a health study.

Sample: A small number of people chosen from a larger population (See **Population**).

Source (of Contamination): The place where a chemical comes from, such as a landfill, pond, creek, incinerator, tank, or drum. Contaminant source is the first part of an **Exposure Pathway**.

Special Populations: People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Statistics: A branch of the math process of collecting, looking at, and summarizing data or information.

Superfund Site: See **NPL**.

Survey: A way to collect information or data from a group of people (**population**). Surveys can be done by phone, mail, or in person. ATSDR cannot do surveys of more than nine people without approval from the U.S. Department of Health and Human Services.

Synergistic effect: A health effect from an exposure to more than one chemical, where one of the chemicals worsens the effect of another chemical. The combined effect of the chemicals acting together are greater than the effects of the chemicals acting by themselves.

Toxic: Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

Toxicology: The study of the harmful effects of chemicals on humans or animals.

Tumor: Abnormal growth of tissue or cells that have formed a lump or mass.

**Uncertainty
Factor:** See **Safety Factor**.

**Urgent Public
Health Hazard:** This category is used in ATSDR's Public Health Assessment documents for sites that have certain physical features or evidence of short-term (less than 1 year), site-related chemical exposure that could result in adverse health effects and require quick intervention to stop people from being exposed.